Name_____Date_____Block_____

NOTES – Inverse Functions – Switching X and Y

Part 1 – The Inverse of a Relation:

Consider the function $f = \{(0,3),(-6,5),(2,4)\}$.

This function has an ***inverse***, denoted as f^{-1}. The inverse is $f^{-1} = \{(3,0),(5,-6),(4,2)\}$.

Describe how to find the inverse: Switch x and y

Part 1 Practice:

Now find the inverse relation for $g = \{(-4,6),(8,2),(5,0),(3,-1)\}$.

$g^{-1} = \{(6,-4),(2,8),(0,5),(-1,3)\}$

Part 2 – The Inverse of a Function in Equation Form:

You can also find an inverse for a function given in terms of x. Since the main idea above is to switch the x's and y's, the same principle holds for the more complicated example. Consider $f(x) = 4x - 5$. To find $f^{-1}(x)$, just use the following steps:

1. Write $f(x)$ as y instead.
2. Interchange x and y (make them switch places).

$y = 4x - 5$
$x = 4y - 5$
$+5 \quad +5$

3. Solve for y.

$\frac{x+5}{4} = \frac{4y}{4}$

4. Write y as f^{-1}. (the "inverse")

$y = \frac{x+5}{4}$

This is the inverse of the original function.

$f^{-1}(x) = \frac{x+5}{4}$

Part 2 Practice:

Use the steps above to find the inverse of $f(x) = \frac{1}{5}x + 3$.

Step 1: *Write $f(x)$ as y instead.*
Step 2: *Interchange x and y (make them switch places).*

$y = \frac{1}{5}x + 3$
$x = \frac{1}{5}y + 3$
$-3 \quad -3$

Step 3: *Solve for y.*

$5(x-3) = 5 \cdot \frac{1}{5}y$

Step 4: *Write y as f^{-1}.*

$f^{-1}(x) = 5x - 15$

Name_____Date_____Block_____

Part 3 – Are They Inverses? –Verifying Your Answers:
With Composition

Option1 – Composition

*If two functions are inverses, then $f[g(x)] = g[f(x)] = x$

Find $f[g(x)]$ and $g[f(x)]$. If they are both equal to x, then the functions are inverses.

Practice: Use composition to test if $f(x) = 5x + 10$ and $g(x) = \frac{1}{5}x - 2$ are inverses.

$f[g(x)]$

$5\left(\frac{1}{5}x - 2\right) + 10$

$= x - 10 + 10$

$= x$ ✓

$g[f(x)]$

$\frac{1}{5}(5x + 10) - 2$

$x + 2 - 2$

$= x$ ✓

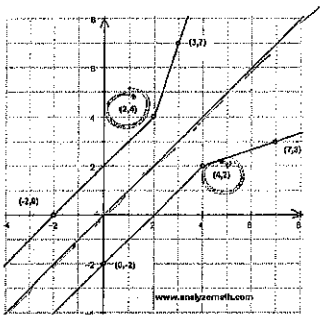
Yes, inverses

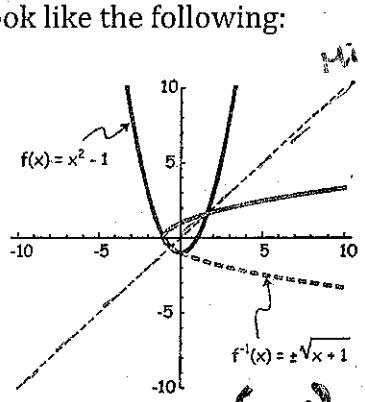
With a Graphing Calculator

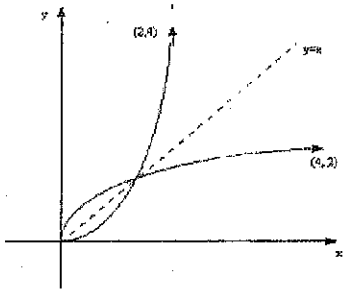
Option 2 – Graph 3 equations at once: the function, the inverse (you solved for), y=x.

*If two functions are inverses, they are reflections of each other over the line y=x.

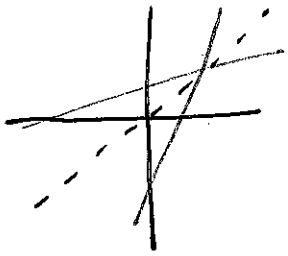
For example, they might look like the following:







Practice: Graph $f(x) = 2x - 3$, $g(x) = \frac{(x+3)}{2}$ and y=x to see if the two functions are inverses. Sketch what you see and state your answer clearly.



yes, inverses

CLASSWORK: DO THESE ON A SEPARATE PIECE OF PAPER <u>SHOWING WORK</u> (and check your answers with BOB):

p. 393 #5-11 all, 21-31 odd (For 10 and 11, you may use Option 1 or 2.)